In re Application of: Yair EIN-ELI et al
Serial No.: 10/551,714
Filed: July 20, 2006
Office Action Mailing Date: March 23, 2009

Examiner: PARVINI Pegah
Group Art Unit: 1793
Attorney Docket: 30579

In the claims:

1. (Currently amended) A composition useful for the formation of a passivating layer on a surface, the surface including more than ~~about~~ 5% copper by weight, the composition comprising a solution ~~having~~ which has a pH equal to or greater than ~~about~~ 9, ~~and~~ having an oxidation potential sufficient to oxidize the surface to form copper oxides and being devoid of a film-forming agent, a copper complexing agent and/or ammonium cations, wherein neither copper nor said copper oxides are ~~substantially~~ soluble in the composition.

2. (Currently amended) The composition of claim 1, wherein the surface includes more than ~~about~~ 10% copper by weight.

3. (Currently amended) The composition of claim 1, wherein the surface includes more than ~~about~~ 20% copper by weight.

4. (Currently amended) The composition of claim 1, wherein the surface includes more than ~~about~~ 40% copper by weight.

5. (Currently amended) The composition of claim 1, wherein the surface includes more than ~~about~~ 50% copper by weight.

6. (Currently amended) The composition of claim 1, wherein the surface includes more than ~~about~~ 80% copper by weight.

7. (Currently amended) The composition of claim 1, wherein said oxidation potential is ~~more positive~~lower than ~~about~~ P_{pH} ~~V~~ volt relative to a saturated calomel reference electrode, where

$$P_{pH} = -0.05 \times pH + 0.425$$

pH being said pH of the composition.

8. (Currently amended) The composition of claim 1, wherein said pH is between ~~about~~ 9 and ~~about~~ 10 and said oxidation potential is lower~~more positive~~ than ~~about~~ 0.05 volt~~V~~ relative to a saturated calomel reference electrode.

9. (Currently amended) The composition of claim 1, wherein said pH is between ~~about~~ 10 and ~~about~~ 11 and said oxidation potential is lower ~~more positive~~ than ~~about~~ 0.1 volt~~V~~ relative to a saturated calomel reference electrode.

10. (Currently amended) The composition of claim 1, wherein said pH is between ~~about~~ 11 and ~~about~~ 12 and said oxidation potential is lower ~~more positive~~ than ~~about~~ 0.15 volt~~V~~ relative to a saturated calomel reference electrode.

11. (Currently amended) The composition of claim 1, wherein said pH is between ~~about~~ 12 and ~~about~~ 13 and said oxidation potential is lower~~more positive~~ than ~~about~~ 0.2 volt~~V~~ relative to a saturated calomel reference electrode.

12. (Currently amended) The composition of claim 1, wherein said oxidation potential is lower~~more positive~~ than a saturated calomel reference electrode by an oxidation potential selected from the group consisting of -0.2 volt~~V~~, -0.15 volt~~V~~, -0.10 volt~~V~~, -0.05 volt~~V~~, 0.0 volt~~V~~, 0.05 volt~~V~~, 0.10 volt~~V~~, 0.15 volt~~V~~, 0.20 volt~~V~~, 0.25 volt~~V~~, 0.3 volt~~V~~, 0.35 volt~~V~~, 0.40 volt~~V~~, 0.45 volt~~V~~, 0.50 volt~~V~~, 0.55 volt~~V~~, 0.60 volt~~V~~, 0.65 volt~~V~~ and 0.7 volt~~V~~.

12.5 (Canceled)

13. (Original) The composition of claim 1, comprising

a) a cation selected from the group of alkaline metal cations and alkaline earth metal cations; and

b) an anion of a weak acid.

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14. (Original) The composition of claim 13, wherein said cation is selected from the group consisting of Li^+, Na^+, K^+, Rb^+, Cs^+, Be^{2+}, Mg^{2+}, Ca^{2+}, Sr^{2+} and Ba^{2+}.

15. (Currently amended) The composition of claim 13, wherein said weak acid has a pKa ~~of~~ greater than ~~about~~ 0.

16. (Original) The composition of claim 13, wherein said anion is selected from the group consisting of acetate, adipate, bicarbonate, bisulfate, carbonate, chloroacetate, citrate, crotonoate, cyanate, glutarate, dihydrogen phosphate, hydrogen phosphate, hydrogen sulfate, hydroxide, d-lactate, l-lactate, d-malate, l-malate, maleate, d-mandelate, l-mandelate, malonate, oxalate, permanganate, phosphate, hydrogen phthalate, phthalate, propanoate, succinate, sulfanilate, sulfate, d-tartarate and l-tartarate.

17. (Original) The composition of claim 13, wherein said cation is K^+ and said anion is carbonate.

18. (Original) The composition of claim 13, wherein said cation is Cs^+ and said anion is carbonate.

19. (Original) The composition of claim 13, further comprising an oxidizing agent.

20. (Original) The composition of claim 19, wherein said oxidizing agent is selected from the group consisting of phenols, peroxides, permanganates, chromates, iodates, iron salts, aluminum salts, sodium salts, potassium salts, phosphonium salts, chlorates, perchlorates, persulfates and mixtures thereof.

21. (Original) The composition of claim 19, wherein said oxidizing agent is selected from the group consisting of phenol, $KMnO_4$, KIO_3, $KBrO_3$, $K_3Fe(CN)_6$, $K_2Cr_2O_7$, V_2O_3, H_2O_2, HOCl, KOCl and $KMgO_4$.

22. (Original) The composition of claim 19, wherein said oxidizing agent is $KMnO_4$.

23-25. (Canceled)

26. (Original) The composition of claim 1, comprising abrasive particles.

27. (Original) The composition of claim 26, wherein said abrasive particles are metal oxides.

28. (Original) The composition of claim 27, wherein said metal oxide is selected from the group consisting of oxides of aluminum, cerium, germanium, silicon, titanium, zirconium and mixtures thereof.

29. (Original) The composition of claim 26, wherein said abrasive particles are chosen from the group comprising SiO_2, CeO_2, Al_2O_3, SiC, Si_3N_4 and Fe_2O_3.

30. (Currently Amended) The composition of claim 26, wherein said abrasive particles comprise between ~~about~~ 1% and 30% by weight of the composition.

31. (Currently Amended) A ~~use of a composition of claim 1 for~~method of forming a passivating layer on a surface, ~~said~~ the surface including more than ~~about~~ 5% copper by weight~~.~~, the method comprising contacting the surface with the composition of claim 1.

32. (Currently Amended) The ~~composition~~ method of claim 31, wherein said surface includes more than ~~about~~ 10% copper by weight.

33. (Currently Amended) The ~~composition~~ method of claim 31, wherein said surface includes more than ~~about~~ 20% copper by weight.

34. (Currently Amended) The ~~composition~~ method of claim 31, wherein said surface includes more than ~~about~~ 40% copper by weight.

35. (Currently Amended) The ~~composition~~ method of claim 31, wherein said surface includes more than ~~about~~ 50% copper by weight.

36. (Currently Amended) The ~~composition~~ method of claim 31, wherein said surface includes more than ~~about~~ 80% copper by weight.

37. (Withdrawn) A method for the preparation of a composition useful for the formation of a passivating layer on a surface, the surface including more than about 5% copper by weight, comprising preparing a solution having a pH equal to or greater than about 9 and having an oxidation potential sufficient to oxidize the surface to form copper oxides, wherein neither copper nor said copper oxides are substantially soluble in the composition.

38. (Withdrawn) The method of claim 37, wherein said oxidation potential is more positive than a saturated calomel reference electrode by an oxidation potential selected from the group consisting of -0.2V, -0.15V, -0.10V, -0.05V, 0.0V, 0.05V, 0.10V, 0.15V, 0.20V, 0.25V, 0.3V, 0.35V, 0.40V, 0.45V, 0.50V, 0.55V, 0.60V, 0.65V and 0.7V.

38.5. (Canceled)

39. (Withdrawn) The method of claim 37, comprising

a) providing a solution comprising water;

b) adding to said solution a cation selected from the group consisting of alkaline metal cations and alkaline earth metal cations and an anion of a weak acid in an amount so that the pH of said solution is equal to or greater than about 9; and

c) adding to said solution an oxidizing agent so that the oxidation potential of said solution is more positive than about P_{pH} V relative to a saturated calomel reference electrode, where

$$P_{pH} = -0.05 \times pH + 0.425$$

pH being the pH of said solution.

40. (Withdrawn) The method of claim 39, wherein said oxidizing agent is selected from the group consisting of phenols, peroxides, permanganates, chromates, iodates, iron salts, aluminum salts, sodium salts, potassium salts, phosphonium salts, chlorates, perchlorates, persulfates and mixtures thereof.

41. (Withdrawn) The method of claim 37, further comprising adding abrasive particles to said solution.

42. (Withdrawn) The method of claim 41, wherein said abrasive particles are metal oxides.

43. (Withdrawn) The method of claim 42, wherein said metal oxide is selected from the group consisting of oxides of aluminum, cerium, germanium, silicon, titanium, zirconium and mixtures thereof.

44. (Withdrawn) The method of claim 41, wherein said abrasive particles are chosen from the group comprising SiO_2, CeO_2, Al_2O_3, SiC, Si_3N_4 and Fe_2O_3.

45. (Withdrawn) The method of claim 41, wherein said abrasive particles comprise between about 1% and 30% by weight of said solution.

46. (Withdrawn) A method of forming a passivating layer on a surface, the surface including more than about 5% copper by weight, comprising contacting the surface with a composition of claim 1.

47. (Withdrawn) A method for planarizing a surface, the surface including more than about 5% copper by weight, comprising abrading the surface in the presence of a composition of claim 1.

48. (Withdrawn) The method of claim 37, wherein the surface includes more than about 10% copper by weight.

49. (Withdrawn) The method of claim 37, wherein the surface includes more than about 20% copper by weight.

50. (Withdrawn) The method of claim 37, wherein the surface includes more than about 40% copper by weight.

51. (Withdrawn) The method of claim 37, wherein the surface includes more than about 50% copper by weight.

52. (Withdrawn) The method of claim 37, wherein the surface includes more than about 80% copper by weight

53. (Currently amended) The composition of claim 12, wherein said oxidation potential is lower~~more positive~~ than a saturated calomel reference electrode by an oxidation potential of at least 0.0 volt~~V~~.

54. (Withdrawn) The method of claim 38, wherein said oxidation potential is more positive than a saturated calomel reference electrode by an oxidation potential of at least 0.0V.